

### **REMARKS**

In the Office Action, claims 1-22 were rejected. In response to the Office Action, claims 14-17 and 20 are cancelled. Upon entry of the amendments, claims 1-13, 15-19, 21 and 22 will be pending in the present patent application. Reconsideration and allowance of all pending claims are requested.

### **Allowable subject matter**

Claims 3-6 and 15-17 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### **Rejections under 35 U.S.C. 102**

Claims 1, 2, 13, 14 and 18-22 were rejected under 35 U.S.C. 102(b) as being anticipated by "Iterative Reconstruction for Reduction of Metal Artifacts in Computed Tomography" (hereinafter, "De Man"). Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration.

### **Claims 1, 18, 19, 21 and 22 and claims depending therefrom**

Claim 1 is directed to a method for reducing artifacts in image data generated by a computed tomography system, the artifacts being due to the presence of a high density object in a subject of interest. The method comprises receiving measured sinogram data from the computed tomography system. The sinogram data is representative of a plurality of measured sinogram elements. The method further comprises reconstructing the measured sinogram data to generate initial reconstructed image data, identifying a trace of the high density object in the measured sinogram data, identifying a region of interest in the initial reconstructed image data, identifying an optimization criterion based upon the region of interest, in an image domain, iteratively adjusting the measured sinogram elements at least in the trace of the high

density object in the measured sinogram data based upon the optimization criterion in the image domain to generate corrected sinogram data, and reconstructing the corrected sinogram data to generate improved reconstructed image data. Claims 18 and 21 recite similar subject matter in the context of a computed tomography system. Likewise, claim 19 recites similar subject matter in the context of a computer-readable medium.

Claim 22 is similarly directed to a method for reducing artifacts in image data generated by a computed tomography system by receiving measured sinogram data from the computed tomography system, the sinogram data being representative of a plurality of measured sinogram elements. The method further comprises reconstructing the measured sinogram data to generate initial reconstructed image data, identifying a sinogram region of interest in the measured sinogram data, identifying an image region of interest in the initial reconstructed image data, identifying an optimization criterion based upon the image region of interest in an image domain, iteratively adjusting the measured sinogram elements in at least the sinogram region of interest based upon the optimization criterion in the image domain to generate corrected sinogram data, and reconstructing the corrected sinogram data to generate improved reconstructed image data.

De Man is a thesis directed to the study of metal artifacts in computed tomography (CT) images. In particular, De Man is directed to the reduction of metal artifacts in CT images using iterative reconstruction techniques.

Applicant respectfully submits that De Man does not disclose a method for reducing artifacts in image data generated by a computed tomography system, comprising at least the steps of identifying an optimization criterion based upon the region on interest, in an image domain and iteratively adjusting the measured sinogram elements at least in the trace of the high density object in the measured sinogram data based upon the optimization criterion in the image domain to generate

corrected sinogram data, as recited in claims 1, 18, 19 and 21. In addition, De Man does not disclose a method for reducing artifacts in image data generated by a computed tomography system, comprising at least the steps of identifying an optimization criterion based upon the region of interest, in an image domain and iteratively adjusting the measured sinogram elements in at least the sinogram region of interest based upon the optimization criterion in the image domain to generate corrected sinogram data, as recited in claim 22.

Applicant has carefully reviewed the section of De Man including page 108, cited by the Examiner in De Man, and submits that this section does not disclose *identifying an optimization criterion* based upon the region of interest, *in an image domain* and *iteratively adjusting the measured sinogram elements* at least in the trace of the high density object in the measured sinogram data *based upon the optimization criterion in the image domain*, to generate corrected sinogram data. Instead this section merely discloses an iterative approach/algorithm for estimating measured sinogram data. In this approach, an estimate of the measured sinogram elements is obtained by sub-sampling the measured sinogram. Further, steps (3)-(5) discussed in this section only disclose that the algorithm is performed for a number of iterations after which the measured sinogram is rebinned to provide a corrected sinogram. Specifically, even if the algorithm disclosed in De Man is performed for a number of iterations, the specific number of iterations that would need to be performed is determined by *defining a stopping criterion, in the sinogram domain*. In other words, the approach/algorithm disclosed in De Man for estimating the measured sinogram data actually simply uses a stopping criterion in the measured sinogram domain, and not an optimization criterion in an image domain, as recited in independent claims 1, 18, 19, 21 and 22 of the present patent application.

Specifically, as recited in independent claims 1, 18, 19, 21 and 22, an optimization criterion based upon a region of interest is identified, in an image

domain, and the measured sinogram elements are iteratively adjusted in the trace of the high density object in the measured sinogram data to generate corrected sinogram data.

Applicant offers, in support of this position, an affidavit in which he, the sole inventor of the presently claimed invention, and author of the De Man reference, further attests to this distinction between his previous work and the claimed subject matter.

Since De Man fails to teach or suggest at least the steps of (1) identifying an optimization criterion based upon the region of interest in an image domain, and (2) iteratively adjusting the measured sinogram elements at least in the trace of the high density object in the measured sinogram data, based upon an optimization criterion in the image domain, to generate corrected sinogram data, De Man cannot anticipate claims 1, 18, 19, 21 and 22. Accordingly, claims 1, 18, 19, 21 and 22 and claims depending therefrom are believed to be clearly patentable over Man as well as other prior art of record. Thus, it is respectfully requested that the rejection of claims 1-22 under 35 U.S.C 102(b) be withdrawn.

### **Rejections under 35 U.S.C. 103**

Claim 7 was rejected under 35 U.S.C 103(a) as being unpatentable over De Man in view of U.S. Patent No. 6,385,278 (hereinafter, "Hsieh"). Claim 8 was rejected under 35 U.S.C. 103(a) as being unpatentable over De Man in view of U.S. Patent Application Publication No. 2004/0001569 (hereinafter, "Luo"). Claim 9 was rejected under 35 U.S.C 103(a) as being unpatentable over De Man in view of U.S. Patent No. 6,813,374 (hereinafter, "Karimi"). For a *prima facie* case of obviousness, the Examiner must set forth the differences in the claim over the applied reference, set forth the proposed modifications of the reference, which would be necessary to

arrive at the claimed subject matter, and explain why the proposed modification would be obvious.

As summarized above, all of the independent claims are believed to be patentable over De Man. The Hsieh, Luo and Karimi references have been reviewed with respect to the 35 U.S.C. 103(a) rejection and do not supply the deficiencies of De Man in regards to disclosing at least the steps of (1) identifying an optimization criterion based upon the region of interest in an image domain and (2) iteratively adjusting the measured sinogram elements at least in the trace of the high density object in the measured sinogram data, based upon an optimization criterion in the image domain to generate corrected sinogram data. Accordingly, claims 7, 8 and 9 are allowable by virtue of their dependency from allowable base claim 1, as well as for the subject matter they separately recite. Thus, it is respectfully requested that the rejection of claims 7, 8 and 9 under 35 U.S.C 103(a) be withdrawn.

### **Conclusion**

In view of the remarks and amendments set forth above, Applicant respectfully requests allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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